2. STOCK ASSESSMENT UPDATES

With the exception of Atlantic sharks, stock assessments for Atlantic HMS are conducted by ICCAT's Standing Committee for Research and Statistics (SCRS). In 2003, the SCRS conducted stock assessments for South Atlantic albacore (not included in HMS FMP management unit) and yellowfin tuna (SCRS, 2003). The most recent stock assessment for small and large coastal sharks is summarized in Amendment 1 to the HMS FMP. NOAA Fisheries expects ICCAT to conduct a stock assessment on pelagic sharks, particularly blue, porbeagle, and shortfin mako sharks in 2004. NOAA Fisheries has not yet scheduled additional stock assessments for either small or large coastal sharks. Other stock assessment information for HMS species will be incorporated as it becomes available in Amendment 2 to the HMS FMP (68 FR 40907; July 9, 2003; draft expected in 2004). Aside from the information included in Table 2.1, only information on new stock assessments is included in this document. For HMS stocks that were not assessed this year, please see the 2003 SAFE report.

Table 2.1 **Stock Assessment Summary Table (SCRS, 2003). See Amendment 1 to the HMS FMP for a summary of the latest shark stock assessments.**

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
North Atlantic Swordfish	B_{02}/B_{MSY} = 0.94 (0.75-1.24)	$0.8B_{MSY}$	F_{01}/F_{MSY} = 0.75 (0.54-1.06)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is not occurring, stock is in recovery
South Atlantic Swordfish	*Not estimated*	$0.8B_{MSY}$	*Not estimated*	F_{year}/F_{MSY} = 1.00	Fully fished; Overfishing may be occurring.*
West Atlantic Bluefin Tuna	SSB_{01}/SSB_{MSY}= 0.31 (low recruitment); 0.06 (high recruitment) SSB_{01}/SSB_{75} = 0.13 (low recruitment); 0.13 (high recruitment)	$0.86SSB_{MSY}$	F_{01}/F_{MSY} = 2.35 (low recruitment scenario) F_{01}/F_{MSY} = 4.64 (high recruitment scenario)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
East Atlantic Bluefin Tuna	SSB_{00}/SSB_{70} = 0.80	*Not estimated*	F_{00}/F_{max} = 2.4	*Not estimated*	Overfished; overfishing is occurring.*

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
Atlantic Bigeye Tuna	B_{02}/B_{MSY} = 0.81-0.91	*$0.6B_{MSY}$ (age 2+)*	F_{01}/F_{MSY} = 1.15	F_{year}/F_{MSY} = 1.00	May be overfished; overfishing is occurring.
Atlantic Yellowfin Tuna	B_{01}/B_{MSY} = 0.73 - 1.10	*$0.5B_{MSY}$ (age 2+)*	F_{01}/F_{MSY} = .87-1.46	F_{year}/F_{MSY} = 1.00	Not overfished; overfishing may be occurring.
North Atlantic Albacore Tuna	B_{92}/B_{MSY} = 0.68 (0.52-0.86)	*$0.7B_{MSY}$*	F_{02}/F_{MSY} = 1.10 (0.99 - 1.30)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
South Atlantic Albacore Tuna	B_{02}/B_{MSY} = 1.66 (0.74-1.81)	*Not estimated*	F_{02}/F_{MSY} = 0.62 (0.46-1.48)	*Not estimated*	Not overfished; overfishing not occurring.*
West Atlantic Skipjack Tuna	*Unknown*	*Unknown*	*Unknown*	F_{year}/F_{MSY} = 1.00	Unknown
Atlantic Blue Marlin	B_{00}/B_{MSY} = 0.4 (0.25 - 0.6)	*$0.9B_{MSY}$*	F_{99}/F_{MSY} = 4.0 (2.5 - 6.0)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
Atlantic White Marlin	B_{01}/B_{MSY} = 0.12 (0.06-0.25)	*$0.85B_{MSY}$*	F_{00}/F_{MSY} =8.28 (4.5-15.8)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
West Atlantic Sailfish	*Not estimated*	*$0.75B_{MSY}$*	*Not estimated*	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.

* South Atlantic swordfish, South Atlantic albacore and East Atlantic bluefin tuna are not found in the U.S. EEZ.

2.1 Stock Assessment Update: ATLANTIC YELLOWFIN TUNA

The SCRS conducted a stock assessment for yellowfin tuna in 2003. The information below revises the 2003 SAFE Report.

2.1.1 Life History/Species Biology Information

The HMS FMP includes summary information on the life history of yellowfin tuna. Findings from recent research on yellowfin tuna life history as summarized in the 2003 report of the SCRS follow. Several collaborative studies were conducted by U.S. scientists in cooperation

with scientists from other countries. Cooperative research by NOAA Fisheries and the Instituto Nacional de la Pesca (INP) in Mexico continued and resulted in a joint analysis of the U.S. and Mexican longline catch per unit effort (CPUE) of yellowfin in the Gulf of Mexico (SCRS/03/061). Cooperative research plans include further development of research projects on other tunas, as well as the refinement of the yellowfin tuna indices as additional data become available. Cooperative research on yellowfin tuna abundance indices, catch at age, and life-history studies is also continuing with Venezuelan scientists. One document on Venezuelan longline catch rate patterns resulted from this collaboration in 2003 (SCRS/03/054) and additional working papers based on this collaboration are expected in future years.

Several other working papers were provided in support of the 2003 stock assessment of yellowfin tuna (July, Merida, Mexico). Two relative abundance patterns (one for the Gulf of Mexico and another for the Atlantic regions fished by U.S. longline vessels) based on U.S. pelagic longline data from 1981 to 2002 were presented in SCRS/03/060. Additionally, a relative abundance index based on data collected through the Large Pelagic Survey from the Virginia-Massachusetts rod and reel fishery (1986-2002) was presented in SCRS/03/062.

New information from a genetic study was presented in SCRS/03/063. The phylogenetic analysis conducted on samples from the Gulf of Mexico and the Gulf of Guinea by researchers at Texas A&M, Galveston, revealed the presence of siblings in several sampling tows for juvenile tuna. Given the high level of genetic diversity at both the mitochondrial and microsatellite loci, the probability of such sampling is extremely low and can best be explained by the unequal reproductive output of certain females. Increases in vulnerability of juvenile yellowfin could be of concern in terms of genetic integrity of the population if levels of reproductive variance are confirmed to be large.

2.1.2 Recent Stock Assessment Results

Based on movement patterns, as well as other information (e.g., time-area size frequency distributions and locations of fishing grounds), ICCAT manages Atlantic yellowfin tuna based on an Atlantic-wide single stock hypothesis. A full assessment was conducted for yellowfin tuna in 2003 (SCRS 2003) applying various age-structured and production models to the available catch data through 2001. At the time of the assessment meeting, only 19 percent of the 2002 catch had been reported (calculated relative to the catch reports available at the time of the SCRS Plenary). The results from all models were considered in the formulation of the Committee's advice. Both equilibrium and non-equilibrium production models were examined in 2003. The effective effort used for the production models was calculated by first creating a combined index from the available abundance indices by fleet and gear, and weighting each index by the catch of that fishery. One of the non-equilibrium models applied estimated the annual effective fishing effort internally, allowing the fishing power trends by fleet to vary.

The estimate of maximum sustainable yield (MSY) based upon the equilibrium models ranged from 151,300 to 161,300 metric ton (mt); the estimates of F_{2001}/F_{MSY} ranged from 0.87 to

1.29. The point estimate of MSY based upon the non-equilibrium models ranged from 147,200-148,300 mt. The point estimates for F_{2001}/F_{MSY} ranged from 1.02 to 1.46; the main differences in the results were related to the assumptions of each model. The Committee was unable to estimate the level of uncertainty associated with these point estimates.

An age-structured virtual population analysis (VPA) was made using eight indices of abundance. The results from this model were more comparable to production model results than in previous assessments, owing in part to a greater consistency between several of the indices used. The VPA results compare well to the trends in fishing mortality and biomass estimated from production models. The VPA estimates that the levels of fishing mortality and spawning biomass in recent years have been very close to MSY levels. The estimate of MSY derived from these analyses was 148,200 mt.

In summary, the age-structured and production model analyses implied that although current (2001) catches are slightly higher than MSY levels, effective effort may be either slightly below or above (up to 46 percent) the MSY level, depending on the assumptions. Consistent with these model results, yield-per-recruit analyses also indicated that 2001 fishing mortality rates could either be above or about the level which could produce MSY. Yield-per-recruit analyses further indicated that an increase in effort is likely to decrease the yield-per-recruit, while reductions in fishing mortality on fish less than 3.2 kg could result in substantial gains in yield-per-recruit and modest gains in spawning biomass-per-recruit.

Table 2.3.2 Summary Table for the Status of Atlantic Yellowfin Tuna

Age/size at Maturity	Age 3/~110 cm curved fork length
Spawning Sites	Tropical waters
Current Relative Biomass Level *Minimum Stock Size Threshold*	B_{01}/B_{MSY} = 0.73 - 1.10 $0.5B_{MSY}$ (age 2+)
Current Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{01}/F_{MSY} = 0.87 - 1.46 F_{year}/F_{MSY} = 1.00
Maximum Sustainable Yield	~ 148,000 mt
Current (2001) Yield **Current (2002) Yield**	159,000 mt 137,500 mt
Current (2001) Replacement Yield	May be somewhat below the current yield
Outlook	Stock not overfished, overfishing may be occurring

2.2 Stock Assessment Update: ATLANTIC ALBACORE TUNA

2.2.1 Life History/Species Biology Information

No new life history information is available for Atlantic albacore tuna. Please see the 2003 SAFE report.

2.2.2 Recent Stock Assessment Results

North Atlantic - Please see the 2003 SAFE report.

South Atlantic - In 2003, an age-structured production model (ASPM), using the same specifications as in 2000, was used to provide a Base Case assessment for South Atlantic albacore. Results were similar to those obtained in 2000, but the confidence intervals were substantially narrower. In part, this may be a consequence of additional data now available, but the underlying causes need to be investigated further. The estimated MSY and replacement yield from the 2003 Base Case (30,915 mt and 29,256 mt, respectively) were similar to those estimated in 2000 (30,274 mt and 29,165 mt). In both 2003 and 2000, the fishing mortality rate was estimated to be about 60 percent of F_{MSY}. Spawning stock biomass has declined substantially relative to the late 1980s, but the decline appears to have leveled off in recent years and the estimate for 2002 remains well above the spawning stock biomass corresponding to MSY. A statistical (Bayesian) age structured production model was used for the first time in 2003. The results from this model were qualitatively similar to those from the ASPM. Projections were carried out using this alternate model.

Table 2.3.4 Summary Table for the Status of South Atlantic Albacore Tuna

Age/size at Maturity	Age 5/~90 cm curved fork length
Spawning Sites	Subtropical western waters of the southern Hemisphere
Current Relative Biomass Level	B_{02}/B_{MSY} = 1.66 (0.74 - 1.81)
Current Relative Fishing Mortality Rate	F_{02}/F_{MSY} = 0.62 (0.46 - 1.48)
Maximum Sustainable Yield	30,200 mt (50 - 31,400)
Current (2002) Yield	31,582 mt
Current Replacement Yield (2002)	29,256 mt (24,530 - 32,277)
Outlook	Not overfished; overfishing is not occurring

[1]This figure includes reported catch, provisional catch reported to the SCRS, and carry-overs

References for Section 2

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